REMARKS

Claims 1-6 and 8-18 are currently pending in the above-identified patent application.

In the Response to Arguments portion of the subject Office Action, the Examiner stated that applicant's arguments filed on 11 May 2009 have been fully considered, but they are not persuasive. The Examiner stated that applicant asserted that U.S. Patent No. 5,724,539 (hereinafter Riggle) teaches away from applicant's claimed invention since applicant states that Riggle clearly criticizes, discredits, or otherwise discourages the claimed subject matter. The Examiner, however, states that Riggle teaches that the claimed configuration is possible to construct and will operate accordingly, but that Riggle simply states that such a configuration is undesirable for them because the configuration would be economically undesirable as it leads to poor utilization of the storage media. Rather than a teaching away, the Examiner submitted that such a teaching is merely an ordinary engineering design consideration, and that economic considerations are ordinary considerations when trying to balance speed, space, and cost in the design of a system. Therefore, the Examiner concluded that Riggle does not teach away from the claimed invention, but merely shows ordinary design considerations with regard to building the system.

Applicant respectfully disagrees with the Examiner's interpretation of the teachings of Riggle. Although Riggle states in Col. 5, lines 37-41, that: "Having an over-configured subsystem bandwidth is thus undesirable because it results in inefficient and costly resource use of the serial subsystem elements such as the controller buffer shared among the disk drives in the array and the computer host interface bus.", Riggle continues in Col. 7, lines 20-21, that: "However, **the uniform sector format of FIG. 3 results in poor utilization** of magnetic media storage capacity." (Emphasis added by applicant.), and in lines 57-67 of Col. 7, states further that: "Attempting to connect banded disk drives **130**, organized into the parallel structures of disk array **150** and requiring variable bandwidth, to fixed bandwidth serial elements results in **excessive data transfer latency and poor subsystem performance** if storage subsystem **10** is configured to transfer data

at the lowest rate associated with inner track band **230**. If, on the other hand, the serial elements are configured to support data transfers at the highest rate, i.e. those involving outer track bands **250** only, **the total storage subsystem capacity is underutilized** since only the average bandwidth is required over a sufficiently large number of transfer requests." (Emphasis added by applicant.).

The Federal Circuit stated in *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004) that: "The prior art's **mere disclosure of more than one alternative does not constitute a teaching away** from any of these alternatives **because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed** in the '198 application." (Emphasis added by applicant.). The words: "**excessive data transfer latency and poor subsystem performance**" cannot be interpreted as other than criticizing, discrediting and discouraging to "...addressing a plurality of data strips from said data to a chosen disk of said plurality of disk drives such that the throughput of each of said plurality of disk drives is maximized; forming a data stream comprising said data strips, said data stream having a first throughput; creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput ... ." (Emphasis added by applicant.), as is recited in subject claim 1.

The Examiner continued that applicant also argues that the relied upon references, Riggle in combination with U.S. Patent No. 6,915,380 (hereinafter Tanaka), do not teach directing a plurality of parallel data streams to a corresponding plurality of said plurality of disk drives using a crossbar switch, but that the Examiner disagrees. The Examiner submitted that Riggle teaches that the parallel data streams are directed to each disk drive, but does not teach that a crossbar switch directs the data; however, the Examiner continued that Tanaka teaches that a crossbar switch directs parallel data, that Tanaka teaches that a data frame is input as serial data, but is then converted to parallel data in Col. 6 Lines 55-64, and that the parallel data is then directed to the appropriate output port in Col. 6 Lines 55-64. Therefore, the Examiner concluded that Tanaka cures

the deficiency of Riggle, that a crossbar switch directs parallel data to the appropriate destination.

Applicant respectfully disagrees with the Examiner's analysis of Tanaka. Lines 55-64 of Tanaka recite: "The serial-to-parallel converter **SP1 converts the 8B10B-encoded serial data into parallel data** of 10-bit width and writes the parallel data into the buffer memory BM**1** in synchronism with the data transfer rate equal to one tenth of that at port **P1**. The 8B10B decoder DEC**1** reads out the 10-bit parallel data from the buffer memory BM1 in synchronism with the operation speed of the crossbar switch XSW and subjects the 10-bit parallel data to 8B10B decoding to convert it into 8-bit parallel data." (Emphasis added by applicant.). Further, in Col. 6, lines 4-16, of Tanaka it is stated: "In the conventional disk storage system shown in FIG. 9, data and a parity thereof to be written in the disk array are already distributed on separate channels D**1**, D**2**, D**3** and D**4** connected to the disk adapter DKA. On the contrary, the disk storage system of the embodiment is different from the conventional system in that the data and the parity are distributed on separate channels after the passage of the switch SW**1**. Operation of the switch characterized in the disk storage system of the embodiment is next described by taking the switch SW**1** as an example. Operation of the switches SW**2** to SW**4** is also the same as that of the switch SW**1**.", and in Col. 6, lines 35-52, it is stated: "As shown in FIG. 2, the switch SW1 includes a crossbar switch XSW and a switch controller CTL. The crossbar switch XSW is of 5x5 and includes input ports in**1**, in**2**, in**3**, in**4** and in**5** and output ports out**1**, out**2**, out**3**, out**4** and out**5**. **The frame inputted from the port P1** is supplied through a serial-to-parallel converter SP**1**, a buffer memory BM**1** and an 8B10B encoder DEC**1** to the switch controller CTL and the input port in**1**. **The switch controller CTL decodes a destination address written in a header portion of the input frame and changes over the crossbar switch XSW**. By way of example, when the port P**2** is selected as the output port, the inputted frame passes through the output port out**2**, an 8B10B encoder ENC**2**, a buffer memory BM**2** and **a parallel-to-serial converter PS2 and is outputted from the port P2.**" (Emphasis added by applicant).

Clearly, Tanaka teaches that the crossbar switch XSW directs a single parallel signal to a chosen output port, this signal then being converted to a serial signal.

Subject claim 1 recites in part: "... creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput; directing said plurality of parallel data streams to a corresponding plurality of said plurality of disk drives using a crossbar switch ... ." (Emphasis added by applicant.). The use of the crossbar switch in Tanaka therefore teaches away from subject claim 1 in that a single frame is input to the crossbar switch of Tanaka, the ultimate output being a serial signal, whereas a plurality of parallel data streams is directed to appropriate disk drives by the crossbar switch of subject claim 1. Similar recitations may be located in subject independent claims 9 and 14.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Further, a prior art reference that 'teaches away' from the claimed invention is a significant factor to be considered in determining obviousness; however, "the nature of the teaching is highly relevant and must be weighed in substance. A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." *In re Gurley*, 27 F.3d 551, 554, 32 USPQ2d 110, 1132 (Fed. Cir. 1994). Riggle does not simply describe the present claimed invention as somewhat inferior; rather, as stated hereinabove, strong discouraging language is stated.

The Examiner then restated the rejections set forth in the Office Action dated January 09, 2009.

Applicant respectfully disagrees with the Examiner's rejection of claims 1-6, and 8-19 under 35 U.S.C. 103(a) as being unpatentable over Riggle in view of

Tanaka for the reasons to be set forth hereinbelow. Reexamination and reconsideration are requested.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). For the reasons to be set forth hereinbelow, applicant believes that independent claims 1, 9 and 14 are patentable over the combination of Riggle with Tanaka. Therefore, dependent claims 2-6, 8, 10-13, and 15-18, which depend therefrom, respectively, are patentable, and applicant believes that no further response is necessary regarding these claims.

Turning now to Riggle, Col. 5, lines 24-41, state: "One of the main objectives of grouping disk drives into an array is to meet the demands for a higher storage subsystem bandwidth. **To provide the bandwidth increase in an economically feasible manner the subsystem resources must be used at their optimal capacity levels.** If the storage subsystem bandwidth is configured to accommodate the highest transfer rate, the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface. Hence a sufficiently large sample transfer unit will span a range of track bands from the disk drives involved. The implication is that the array of disk drives will tend to transfer at an average aggregate bandwidth over a statistically large number of transfers. Having an over-configured subsystem bandwidth is thus undesirable because it results in inefficient and costly resource use of the serial subsystem elements such as the controller buffer shared among the disk drives in the array and the computer host interface bus." (Emphasis added by applicant.).

Clearly, Riggle teaches away from configuring the storage subsystem bandwidth to accommodate the highest transfer rate since the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface.

Column 7, lines 4-32, of Riggle state further: "It is possible to format each disk surface 170 of a disk drive 120 to have a constant number of sectors on every track, as shown in FIG. 3. With sector boundaries 180 aligned radially

throughout the disk surface 170, each sector 190 is traversed by the read/write head 200 mounted on a positioner 210 and associated with the disk surface in the same period of time. Hence, the same amount of data, such as a 512 byte block, can be written to each track within every sector 190. This uniform sector format of disk surface 170 with the same number of data bits stored between any two consecutive sector boundaries 180 leads to a constant data transfer rate from any track regardless of its radius. If a transfer unit is distributed among a stripe set of disk drives 130, all the drives can participate in the data movement simultaneously. In the ideal case of a fully parallel transfer the aggregate device bandwidth is thus equal to the individual disk drive bandwidth times the number of drives in the stripe set. However, the uniform sector format of FIG. 3 results in poor utilization of magnetic media storage capacity. Since the length of the track segment bounded by the adjacent sector boundaries 190 increases with track radius, the linear bit density on the outer tracks is lower than that on the shorter inner tracks. An effective way to prevent loss of useful storage capacity is to divide the disk surface into a number of bands of neighboring tracks. As is depicted in a simplified diagram of FIG. 4, each track band is formatted, for example, to have the same number of sectors, each sector defining the length of a track segment needed to store a block of data. An ever greater number of sectors is written on the outer bands in order to maintain a more nearly constant linear bit density throughout the disk surface. As a disk 220 is rotated at a constant angular velocity, however, the linear velocity of the tracks moving past read/write head 200 increases in direct proportion to the track radius. Since the intent of track banding is to produce a uniform linear bit density on every track, the number of data bits encountered by read/write head per unit time grows linearly with its velocity and, therefore, disk radius. Hence, the data transfer rate with read/write head 200 positioned over a track in an inner band 230 is the lowest, increasing for tracks in a middle band 240, and reaching its maximum for transfers involving tracks located in an outer band 250." (Emphasis added by applicant.).

Claim 1 of Riggle recites in part: "... each track requiring a different track data transfer rate, the tracks being so selected that a sum of the data transfer rates is substantially equal to the bandwidth of the communication channel; ... ."

Thus, Riggle teaches away from equal data transfer rates to each disk drive since the uniform sector format of FIG. 3 thereof results in **poor utilization** of magnetic media storage capacity.

Subject claim 1 recites in part: "...addressing a plurality of data strips from said data to a chosen disk of said plurality of disk drives such that the throughput of each of said plurality of disk drives is maximized; forming a data stream comprising said data strips, said data stream having a first throughput; creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput ... ." (Emphasis added by applicant.). Similar language may be found in independent claims 9 and 14.

Subject independent claims 1, 9 and 14 recite maximizing the throughput of each of said plurality of disk drives. Riggle does not teach this limitation. Rather, Riggle teaches away from this condition by stating that the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface.

In re Gurley, 27 F.3d 551, 31 USPQ2d 1130 (Fed. Cir. 1994), states on page 1131 that: "... A reference may be said to teach away **when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant**. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by applicant. ... ." (Emphasis added by applicant.). The teaching of Riggle is clearly that different individual disk drive bandwidth times are desired if poor utilization of magnetic media storage capacity is to be avoided. Article 2141.02 Differences Between Prior Art and Claimed Invention of the Manual Of Patent Examining

Procedure, Section VI requires that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983).

The Court in *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004) stated: "Appellants quote language from In re Gurley that '[a] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." 27 F.3d at 553. Appellants argue that "the prior art disclosed alternatives to each of the claimed elements A [the perimeter], B [the shape of the surface], and C [the orientation of the surface]. Choosing one alternative necessarily means rejecting the other, i.e., following a path that is 'in a divergent direction from the path taken by applicant.' This interpretation of our case law fails. **The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the '198 application.** Indeed, in the case cited by appellants, In re Gurley, we held that the invention claimed in the patent application was unpatentable based primarily on a prior art reference that disclosed two alternatives, one of which was the claimed alternative. Accordingly mere disclosure of alternative designs does not teach away." (Emphasis added by applicant.).

Clearly, Riggle does not teach configuring the storage subsystem bandwidth to accommodate the highest transfer rate since, according to Riggle, the bandwidth capacity is underutilized on average because for full storage capacity utilization, data must be placed on all available tracks on the disk surface. Riggle teaches further that to provide bandwidth increase in an economically feasible manner, the subsystem resources must be used at their optimal capacity levels. Riggle clearly **criticizes, discredits, or otherwise**

discourages the solution claimed in the subject claims, that of configuring the storage subsystem bandwidth to accommodate the highest transfer rate.

Further, the Title of the Riggle patent is "System For Selectively Storing Stripes Of Data In Tracks Of Disks So That Sum Of Transfer Rates Of Stripes Match Communication Bandwidth To Host". Moreover, as stated hereinabove, Riggle states: "One of the main objectives of grouping disk drives into an array is to meet the demands for a higher storage subsystem bandwidth. **To provide the bandwidth increase in an economically feasible manner the subsystem resources MUST BE USED at their optimal capacity levels.** The invention of Riggle is clearly directed to providing a higher storage subsystem bandwidth. In order to do so, Riggle teaches that the subsystem resources must be used at their optimal capacity levels. The use of the language "must be used" does not permit the language: "If the storage subsystem bandwidth is configured to accommodate the highest transfer rate, the bandwidth capacity is underutilized on average because for full storage capacity utilization data must be placed on all available tracks on the disk surface." as part of the invention.

Therefore, applicants respectfully believe that upon reading Riddle reference, one having ordinary skill would be discouraged from following this path and would be led in a direction divergent from the path taken by applicant. Riddle et al. thus teaches away from the present claimed invention. Tanaka does not change this conclusion.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Clearly, Riggle does not disclose configuring the storage subsystem bandwidth to accommodate the highest transfer rate. Therefore, applicant respectfully believes that the Examiner has not established a *prima facie* case of obviousness as is required under 35 U.S.C. 103.

Tanaka in Col. 6, lines 35-46, states: "As shown in FIG. 2, the switch SW**1** includes a crossbar switch XSW and a switch controller CTL. The crossbar switch XSW is of 5x5 and includes input ports in**1**, in**2**, in**3**, in**4** and in**5** and output ports out**1**, out**2**, out**3**, out**4** and out**5**. **The frame inputted from the port P1** is supplied through a serial-to-parallel converter SP**1**, a buffer memory BM**1** and an 8B10B encoder DEC**1** to the switch controller CTL and the input port in**1**. **The switch controller CTL decodes a destination address written in a header portion of the input frame and changes over the crossbar switch XSW.**" (Emphasis added by applicant). Subject claim 1 recites in part: "... creating a plurality of parallel data streams, each of said plurality of parallel data streams having an equal second throughput, said second throughput being smaller than said first throughput; directing said plurality of parallel data streams to a corresponding plurality of said plurality of disk drives using a crossbar switch ... ." (Emphasis added by applicant.). The use of the crossbar switch in Tanaka therefore teaches away from subject claim 1 in that a single frame is input to the crossbar switch of Tanaka, whereas a plurality of parallel data streams is directed to appropriate disk drives by the crossbar switch of subject claim 1. Similar recitations may be located in subject independent claims 9 and 14.

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In view of the discussion presented hereinabove, applicant believes that subject claims 1-6 and 8-18 are in condition for allowance or appeal, the former action by the Examiner at an early date being earnestly solicited.

Reexamination and reconsideration are respectfully requested.

Respectfully submitted,

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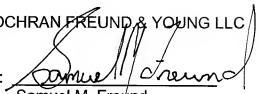
Date: September 28, 2009

By: 

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